(No Model.)

W. ROBINSON

ELECTRO PNEUMATIC GATE AND SIGNAL OPERATING APPARATUS.

No. 267,259. Patented Nov. 7, 1882.

Fig. 1.

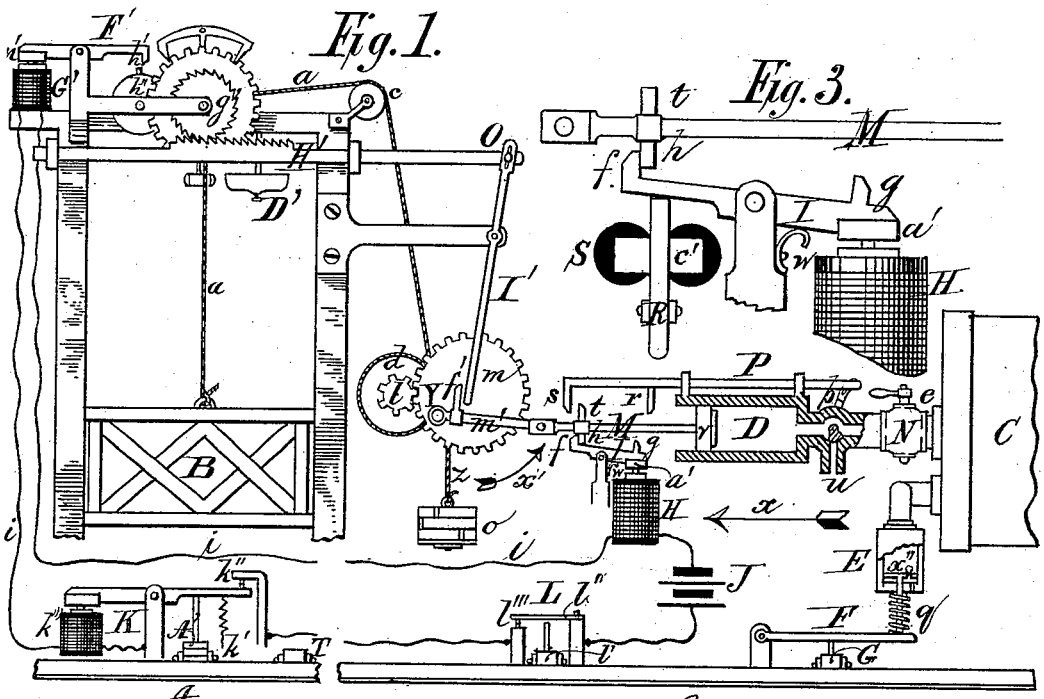


Fig. 3.

Fig. 2.

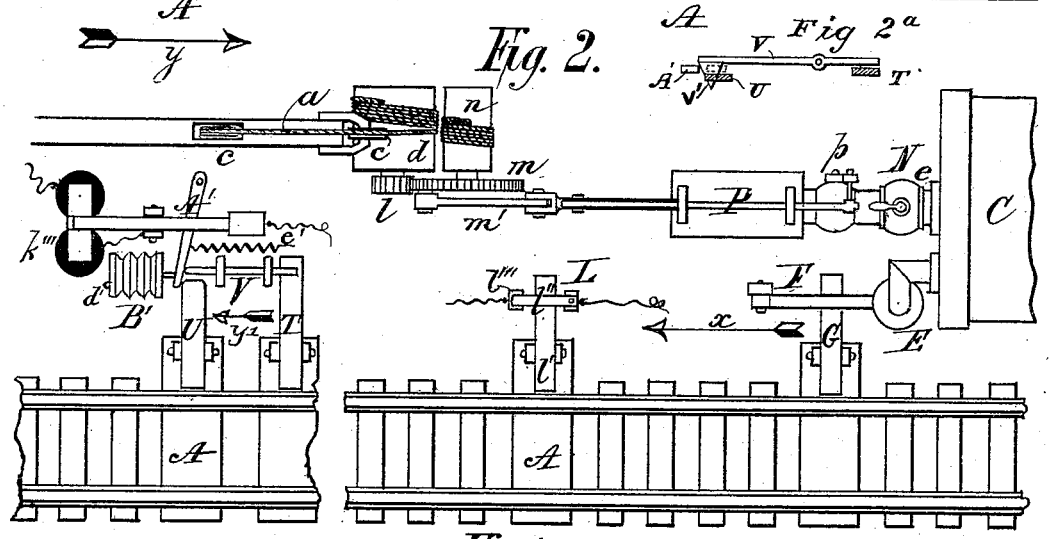
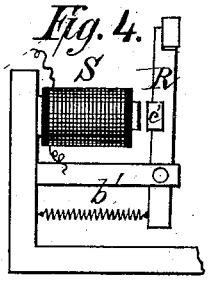


Fig. 2a

Fig. 4.



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ELECTRO-PNEUMATIC GATE AND SIGNAL-OPERATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 267,259, dated November 7, 1882.

Application filed March 9, 1882. (No model.) Patented in England August 30, 1871, No. 2,280, and in France February 29, 1872, No. 94,393.

To all whom it may concern:

Be it known that I, WILLIAM ROBINSON, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Electro-Pneumatic Apparatus for Operating Gates and Signals, (for which Letters Patent No. 2,280, bearing date August 30, 1871, have been obtained in Great Britain by Alexander Melville Clark, as communicated by me, and for which I have obtained Letters Patent in France, No. 94,393, bearing date February 29, 1872,) of which the following is a specification, reference being had to the accompanying drawings.

The invention has for its object the automatic opening and closing of gates, or the actuation of signals (audible or visible) by a moving vehicle while at a distance therefrom.

The invention consists in a suitable mechanism for actuating said gates or signals through the agency of compressed air, the action of which is controlled by an electro magnet or magnets, these being in turn controlled (as regards the opening and closing of their actuating-circuits) by a vehicle while in motion.

In addition to the several details of its construction, the invention includes certain mechanism for the operation of an air-pump by a moving vehicle, and also mechanism for preventing a vehicle, while passing in one direction, from opening or closing such electrical circuits as are designed to be controlled by vehicles passing in the opposite direction.

The invention, while applicable to gates or signals in any situation, is particularly designed for such as are located at the intersection of railways and highways, for the purpose of preventing collisions and other accidents. It will be sufficient here to describe its application in such connection.

Referring to the accompanying drawings, Figure 1 is a side elevation, partly sectional, of the invention as applied to a railway-crossing, the electric circuits being shown in diagram. Fig. 2 is a plan view of a portion of the same. Fig. 3 is a front elevation of the mechanism by which the magnet controls the action of the piston-rod and valve. Fig. 4 is a side elevation of the same.

Similar reference-letters apply to corresponding parts.

The railroad-track is shown at A A, Figs. 1 and 2.

The gate closing the crossing is shown at B. It is represented in the figure as closed, or in the position it is designed to occupy during the passage of a train. The gate is suspended by a cord or chain, *a a*, which passes over the pulleys *c c* and winds around the drum *d*.

A closed reservoir or tank (partially shown at C) contains a supply of compressed air, which may be furnished by a compressing-pump, E, or by any other adequate arrangement. This pump is preferably operated by the levers F and G, which are actuated by the wheels or any suitable appendage of one or more passing vehicles, which, while traveling along the track, may press up on or against the short arm of the lever G, thereby causing the long arm of said lever to elevate the lever F and piston *x''* of the pump. On the removal of the pressure the levers return to their normal position in virtue of the force exerted by the spring *q*.

The passage of the compressed air through the exit-pipe *e* is regulated in respect to quantity by means of the cock or valve N, and controlled with reference to its entrance to the cylinder D by the valve *p*, which is opened and closed by means of the valve-rod P.

Fig. 1 shows the valve *p* as opened, while the exhaust-pipe *u* is closed. When the valve *p* is in this position the cylinder D is filled with compressed air, and its pressure forces the piston *v* in the direction indicated by the arrow *x;* but its further progress is arrested by the spur *h*, projecting from the piston-rod M, which comes in contact with the stop *f* upon the armature-lever I. This armature-lever is actuated in the ordinary manner by an electro-magnet, H, which is shown in the figure in its magnetic condition produced by an electric current from the battery J, which traverses its coils and holds its armature *a'* in contact with its poles in opposition to the force exerted by the retracting-spring *w*.

Beginning with the electro-magnet H, the route of the current may be traced as follows: from battery J to circuit-breaker L, thence to

circuit-closer K, (represented in the figure as closed,) conductor *i*, magnet G′, (the function of which will hereinafter be explained,) conductors *i i*, returning to magnet H and the other pole of the battery J.

We have represented the gate B as lowered and the circuit closed. In order to elevate the gate it is only necessary to interrupt the electric circuit, the operation being as follows: Upon the interruption of the circuit the electro-magnet H becomes demagnetized. The armature *a′* and its lever I, carrying the stop *f*, are thereby left free to move under the action of the spring *w*. The stop *f*, on being withdrawn from the path of the spur *h*, no longer prevents the motion of the piston *v*. The latter, by virtue of the action of the compressed air behind it, moves a short distance in the direction of the arrow *x*, during which time the spur *t* engages with a projection, *s*, upon the valve-rod P, and carries the latter a sufficient distance in the same direction to close the valve *p*, cutting off the flow of air to the cylinder D, and to open the exhaust-passage *u*. The air-pressure within the cylinder D is thus removed, and the piston *v* is forced back into the cylinder by power derived from mechanism next to be described. A pitman-rod, *m′*, is eccentrically connected to the toothed wheel *m*, to the axis of which a drum, *n*, is rigidly secured. A weight, *o*, is suspended by cord *z*, which is wound around the said drum, and by its descent the drum and toothed wheel *m* are caused to revolve in the direction indicated by the arrow *x′*. The toothed wheel *m*, in its rotation, gives to the pitman-rod *m′* a motion which, communicated by the piston-rod M, drives the piston into the cylinder until the spur *h* engages with the stop *g* of the armature-lever, which, in virtue of the spring *w*, has been elevated. At the same time the toothed wheel *m*, co-operating with the pinion *l*, causes the drum *d* to revolve and thereby elevate the gate, the weight *o* being sufficient to overbalance the weight of the gate. The gate remains open until the circuit is again closed. Upon closing the circuit the electro-magnet H becomes charged, the armature *a′* is attracted, and the stop *g* disengages from the spur *h*, and allows the weight *o*, acting through the intermediate mechanism, to force the piston *v* still farther back into the cylinder. During this movement of the piston the spur *t* engages with the projection *r* of the valve-rod P and moves the rod a sufficient distance to open the valve *p* and close the exhaust *u*. Compressed air thereupon enters the cylinder, the piston is propelled in the direction indicated by the arrow *x*. This motion is communicated by piston-rod M and pitman *m′* to the wheel *m* and drum *d*, which revolve through a distance equal to a part of its circumference. This movement winds up the weight *o*, at the same time unwinding the cord *a*, and allows the gate to descend.

From the above description it will be understood that so long as a supply of compressed air is maintained in the reservoir C the gate D may be elevated by opening the circuit and lowered by closing the circuit through the magnet H. The opening and closing of the circuit are effected automatically by a moving train upon a railway, in the manner now to be described. Suppose a train, while approaching the crossing at which the gate is situated, in the direction of the arrow *y*, to act upon the circuit-closer K, which may be located at a distance of half a mile (more or less) from the crossing. The circuit is thereby opened and the gate immediately lowered in the manner explained. Having passed the gate, let the same vehicle operate the circuit-breaker L. The gate will be at once elevated.

The mechanism of the circuit-breaker L is as follows: When the short arm of a lever, *l′*, is depressed by the wheels of a passing train its long arm rises and lifts the flat spring *l″*. This breaks the circuit at the point *l‴*.

The mechanism of the circuit-closer K is as follows: A lever, U, is depressed by the wheels of the passing train. This elevates a lever, A′, and closes the circuit at *k″*. A current will then pass through the magnet *k‴*. The latter, by attracting its armature, keeps the circuit closed independently of the lever A′.

It is important that the circuit should only be closed by such trains or vehicles as are approaching the crossing. To prevent it from being operated by those passing in the opposite direction, a lever, T, is provided to be operated by such trains before reaching the lever U. The rod V is provided with a beveled or wedge-shaped tooth, *v′*, (see Fig. 2ª,) which, when the lever T is actuated by a passing train, is depressed thereby and comes in contact with the lever A′, causing it to be moved out of the path of the lever U, so that the subsequent pressure on the latter does not affect the circuit-closer K. To prevent the lever A′ from returning too speedily into position for actuation by the lever U, a bellows, B′, or cylinder and piston, is provided. When the lever A′ is thrust aside the air is forced from the bellows through the valve *d′*. The pressure having been removed, the spring *e′* draws the lever A′ into its normal position; but this requires considerable time, as the lever A is attached to the face of the bellows and air is admitted very slowly through the valve *d′*. A similar contrivance may be used, in connection with the circuit-breaker L, to prevent trains from breaking the circuit while passing in the wrong direction.

From the time of closing the circuit at K to breaking the same at L it is necessary that the armature *a′* should be kept in contact with the poles of the magnet H. This prolonged contact may be secured by making the circuit-closer K, as shown in the figure, of such a form that so long as the electro-magnet *k‴* remains vitalized and attracts its armature the circuit will remain closed, and, as the electro-magnet is included in this circuit, the contact at K will

remain closed until the circuit is broken at another point, as at L, just beyond the crossing; or the device hereinafter described may be advantageously used.

A lever, R, Figs. 3 and 4, is provided, which, when the armature a' is attracted, is drawn by action of the spring b' beneath the elevated end of the lever I. The latter will be firmly held until the lever R is removed, which is preferably effected by placing a circuit-closer just beyond the crossing, so that at the proper time a current may be passed through the magnet S, causing it to attract its armature c' and remove the locking-armature R.

The gate may be arranged to swing on a vertical or on a horizontal axis, levers being substituted for the geared wheels and pulleys; or in place of the gate the same mechanism may be employed to display or conceal or actuate in any mechanical manner a visual signal.

The gate or signals may be operated by trains approaching from either direction by placing circuit-breakers and circuit closers on each side of the gate.

It remains to describe my invention as applied to the use of audible signals.

A bell or alarm, D′, preferably operated by clock-work, is controlled by the tripping-lever F′, attached to the armature n' of the electro-magnet G′. The tripping-lever is of ordinary construction, such that when its spur h' is held clear of the escapement-wheel h'' the bell will ring continuously. The spur h' may be maintained in an elevated position either by the operation of the magnet G′, as shown in the figure, or by a locking-lever similar to that shown at R, Figs. 3 and 4. In either case the movements of the lever are controlled by the moving train in the manner described in connection with the lever I.

The clock-work, which may be operated in a well-known manner by a spring or weight, is automatically wound by the rack H′, gearing with the toothed wheel g'. As the clock-work runs down the rack H′ is moved so as to bring one end of the lever I′, with which it engages at O, into the path of the spur f' of the pitman m'. If then the pitman moves, the spur f' will operate the lever I′ and wind the clock-work. The spur f' may be placed on the piston-rod M, or the clock-work may be wound by any suitable mechanism operated by the piston v or by the direct action of the passing vehicle. A direct-acting electrical bell may be used in place of that described; but the latter possesses the advantage of greater power, while at the same time much less electrical force is required to operate it. The audible signal may be used in combination with or independently of the gate or visual signal, and clock-work mechanism tripped by electricity may be used in the actuating of visual signals.

Either one or several circuits may be employed to accomplish the results herein exhibited. The normal condition may be an open circuit operated by circuit-closers, as described, or a closed circuit operated by circuit-breakers. The system may be operated by the moving vehicles or by hand, and in the latter case a large number might be controlled by a single operator at a central station; or, lastly, electricity might in some cases be dispensed with altogether and the valve d be operated directly by mechanism actuated by the approaching or departing vehicle.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, of a motor automatically controlled by a moving vehicle and driven by fluid-pressure for actuating or changing the position of a gate or signal, and a weight operating under the force of gravity to reverse at times the action of said motor, and thereby restore said gate or signal to its original position.

2. In a gate or signal-operating mechanism, the combination, substantially as hereinbefore set forth, of a piston moved to and fro within a cylinder by fluid-pressure and by the action of a weight, a valve to govern the movements of said piston by controlling the admission and exit of the fluid to and from said cylinder, and means for automatically operating said valve through the movements of a moving vehicle.

3. The combination, substantially as hereinbefore set forth, of a gate or signal actuating mechanism, a valve by the opening and closing of which the operations of said mechanism may be governed, an electro-magnet and armature, and an escapement device whereby the alternate opening and closing of said valve is made to depend upon the movements of said armature.

4. The combination, substantially as hereinbefore set forth, of a gate or signal, a piston moved within a cylinder by fluid-pressure for actuating said gate or signal, a valve for controlling by its opening and closing the alternate movements of said piston, a spurred valve-rod by the alternate motion of which in one direction or the other said valve may be opened and closed, mechanism, substantially such as described, tending to move said valve-rod alternately in opposite directions, and a spurred armature-lever actuated by an electro-magnet for regulating and controlling the movements of said device.

5. In a gate or signal operating mechanism, the combination, substantially as hereinbefore set forth, of a piston moved to and fro within a cylinder, either under the action of compressed air or that of a weight, a spurred piston-rod moving with the said piston, and a spurred armature-lever actuated by an electro-magnet to arrest and control the movements of the said piston-rod and piston.

6. The combination, substantially as hereinbefore set forth, of a gate or signal operating mechanism actuated by fluid-pressure, an electro-magnetic escapement device by which the action of said fluid-pressure is controlled,

and an electric circuit which includes an electric generator, the coil or coils surrounding the electro-magnet of the said escapement device, and a circuit-closer or circuit-breaker, or both, which are adapted to be actuated by a moving vehicle, whereby the action of the said generator upon the said electro-magnet is determined.

In testimony whereof I have hereunto subscribed my name this 4th day of March, A. D. 1882.

WILLIAM ROBINSON.

Witnesses:
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